

Simon Schwartzman

**On the quantification of history:
an experiment with Brazilian data**

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1. Introduction

The use of aggregate data for the study of processes of social and political development is becoming widespread. "Aggregate data" refer to ecological units, in general countries or regions, which are taken as the units of analysis. In principle, the methodology for handling this data is the same as the usual correlational and multivariate techniques. What makes this tendency something relatively new is, for the sociologists, the use of supra-individual units of analysis, and, for the political scientists, the passing from the more institutional and qualitative subjects ("government", "interest groups", "political parties", etc.) to more ecological and quantifiable units. The advantage of this passage is, in principle, quite obvious: aggregate data can be taken as indicators of "soft" phenomena that could not be analyzed directly. The problem, of course, is to make the passage from one type of phenomenon to the other. For the sociologist, the possibility of ecological fallacies¹ is always present, and for the political scientist the relationships between institutional units or actors and hard aggregate data are even less worked on.

The use of this kind of data for historical analysis is less common than within two other disciplines. The need of this kind of study becomes clear when we consider, for instance, the proposed "phases of economic development" that appear in Russett's "World Handbook of Social and Political Indicators" (Russett, Alker Jr, Deutsch, and Lasswell 1964) as well as in other similar works. Hypotheses on

¹ The "locus classicus" for the problem of ecological fallacies is (Robinson 1950) and (Menzel 1965). For a more recent appraisal of these and related questions see (Scheuch 1966).

developmental processes are drawn from synchronic data, and it is very difficult not to fall into diachronic fallacies.

Thus, when it is found that, in a synchronic analysis, the passage from a “traditional primitive” to a “traditional civilization” type of society implies a lead of high education and non-agricultural employment; or that the passage from a “transitional” to an “industrial revolution” society brings a lead of urbanization, what can we expect in terms of actual historical processes in individual countries? It is very likely that historical data would be consistently different from the synchronic ones, if only because of the differences of being a backward country in 1967 or 1850. The replication of these synchronic analysis to historical data is a clear necessity.

Moreover, synchronic analyses of aggregate data are just in its beginnings, and there is no reason why the quantification of history should be a simple consequence of the theoretical demands of political scientists or sociologists. This kind of historical analysis should be developed in its own grounds, striving for having the best answers to the questions of why and how human societies change.

Given this general frame of interests and problems, we tried to get as much of Brazilian historical hard data as we could without doing original research, and see which kind of use we could give to this data for the understanding of the Brazilian process of development. We shall dedicate the next part of this paper to a methodological discussion on aggregate data, the third part to a general evaluation of the data we have and, finally, an attempt to of analysis will be made. The conclusion will draw a balance of what we did, and point to some perspectives.

2. Explanation models with aggregate data in history.

As we said before, the methodology for handling aggregate data is, in principle, the same as the usual correlational and multivariate techniques. We make theoretical assumptions about antecedence and consequence, look for correlations, test for third factors, etc., There is a limitation here, however,

because we are restricted to secondary, hard data, although our interests go far beyond this kind of data. Again, this problem is not substantially different from the one of latent vs. manifest variables, but here it takes a much more serious aspect. The kind of hard data we can get are, typically on population, income, trade, government expenditures, education, communications; and the kind of phenomena we study are, typically, things like power structure, mobilization, leftism, rationality, totalitarianism, etc. The gap is much wider than, say, between latent authoritarianism and the scores of a subject in an “F” scale. There are different ways of going around this problem, and they correspond to what we could call different explanation models.

The main alternative here is between those models that use soft variables as basic independent or dependent factors and those that take them only, if they ever do, as intervenient variables. An example of the last case would be a Malthusian theory of economic development, according to which the independent variables are population growth, and the dependent ones are economic output per capita in terms of product, energy consumption, exports, etc. This explanation model is ideal for the kind of aggregate data that is available, and be easily tested both synchronic and diachronically, its only problem being the reliability of the data.

The other extreme would be the “soft-soft” model: an example would be a psychological theory of development which is, in turn, measured in terms of “satisfaction” or happiness. This model could hardly be tested with aggregate data, although we could think on variables like “need for achievement” as independent, and suicide rates as a negative indicator of the dependent one.

Although purely “soft” or “hard” models are seldom found in the literature, and in all instances it is common the search for hard indicators of soft variables, the difference between the two types of approaches nevertheless remains. In the “hard” side, we will see the development of complex indexes of hard variables as attempts to grasp aspects of the social structure, stratification systems, etc.² No

² Examples of this orientation are many. Cf, for instance, (Di Tella 1965; Heintz 1966); and, of course, (Lerner 1958)

matter how far away we are from the original rough data, an assumption remains: the hard data, of a demographic, economic and geographical character, represent at least the general frame in which society moves. The task from one starting from the “soft” end is much more hazardous: for a few attempts at indirect measurements³, there are many efforts to make direct evaluations of soft phenomena, with dubious success⁴

These two types of explanations are found in the study of contemporary societies, and there is no reason why the same types could not occur in the study of historical processes. Here a most substantial problem arises, which is that of the use of correlational and multivariate techniques.

We can think on the analysis of a country through time in the same way that we think on the analysis of different countries at the same time: in the last case our units are different countries at the same moment, and in the first case the units are the same country at different times. In both cases we have a universe, variables with values for each unit, etc.

But the problem appears when we think that, while in the second case we can safely assume, in general, that our units are independent from each other, in the historical study this assumption does not hold. Each “unit” t is strongly dependent on unit $t-1$, and this impairs the use of the probability reasoning which is the basis of the correlational analysis. Correlational analysis deals, in general, with statements of the kind $X=P(Y,Z)$; they are probability statements that suppose that variables other than Y and Z cancel each other in the determination of X , even if leaving place for the uncertainty expressed by P . This assumption is accepted because, first, there are many examples, or units,, and second, these units are independent from each other.

It is quite clear that this assumption does not hold for historical analysis. If we think on the Brazilian history, for instance, it is clear that one single “hazard”, the crisis of 1929, had a deep impact on the future development of variables like

³ For instance, Richardson uses trade figures as a measure of “good will” among nations (Richardson 1960).

⁴ An example of this dubious success is (Banks and Textor 1963).

industrialization, or the structure of imports.⁵ To look for continuous patterns of determination in historical processes, where the rule is not the cancellation of “hazards” or “spurious” variables through time, but exactly their addition and multiplication, is an “excess of empiricism” that could be misleading.

Which kind of analysis can be done with historical data? The ideal would be to do something similar to a panel analysis. Given two variables, A and B, in a moment T1, for N countries, to look for the same variables and countries in the moment T2, and see whether the relations between A and B change. So, we could see, in a given moment, the kind of relationships that exist between mobilization and per capita income, and then, in a second moment, to see which kind of combinations of these variables are more likely to change, in which direction, etc.

For a single country it is more difficult to say; we can, of course “tell de history” of this country with some precision; we can even see if its history fits some proposed theory; we cannot, however, draw general conclusions without the possibility of comparisons, the same as it is impossible to get more than heuristic insights from the study of single and non-related cases.

3. The Brazilian data, and what to do with them.

The Brazilian data we gathered are a compromise between an ideal list of relevant variables and what was available and could be collected in a relatively small time. The UC Library is relatively well off in Brazilian materials, but the existing data, here and elsewhere, are relatively poor. The first figures we have about population, for instance, are estimates made around 1800, and the first census is from 1872. Data on trade exist since the beginning of the 19th century, although imprecise for the earlier period. Data on colonial trade can be found on the Portuguese documentation.

Our data refer to population, urbanization, inflation, trade, government revenue and electric power. Besides, we have data on volume and value of coffee production and military expenditures.

⁵ It is commonly accepted that the 1929 crisis is an important determinant of the process of industrialization that starts at this time – if not the main determinant (Furtado 1963)

Confronted with the discussion we made before on explanation models, our data do not leave much room for choice. Contrary to the ideal situation in which, starting from a theoretical purpose, we can gather our data, we are here in a much more practical and down-to-life contingency of selecting our model of explanation according to the kind of data we could gather.

Which kind of analysis can we do? There are two possibilities. The first is to proceed inductively and see what our time series offer when we approach them without a well-defined purpose. The second possibility is to develop a general hypothesis, or some, that could be tested with this data. We shall do both, although briefly, in the following.

4. Data analysis

The inspection of our time series shows a general pattern, which is the geometric progression of practically all the raw variables. From 1850 to 1960 Brazil grew in terms of population, urbanization, inflation, governmental expenditures, trade, communications and electric power. In terms of per capita figures, the same geometrical growth is found in urbanization, electric power, communications, but is much less clear on governmental revenue, and does not exist for trade.

The progression in absolute figures indicate that the country is growing, while the changes in relative figures indicate that this growth is followed by structural changes in the society. If we look to the slopes of the different growth curves we can locate the point in time where substantial changes have occurred. So, there is a jump on trade at the beginning of the 20th century and another strong increase in the fifties, after a fall around the 1929 crisis. Data indicating economic and social development has steep rises after the fifties, and this is followed by an intensification of inflation. The contradiction between the growth of relative figures on social and economic development (urbanization, communications, energy) and the figure on trade government expenditures point to some basic gaps that had developed after the forties or fifties and are, presumably, at the basis of the economic and political crisis that had shaken the country since the sixties. Regarding trade, the gap is expressed by the fact that the export capabilities, and in consequence the availability of strong currency did not keep

up with the progressively new demands of a new urban, modernizing society. If this inelasticity of the external sector of the economy had its good effects in the generation of the process of import substitutions, the start being negative when it means rigidity of importing basic elements for a heavy industrialization on its beginnings. Regarding the government, the gap indicates that, at least in terms of rough economic participation, the role of the state did not change meaningfully, being only capable to keep up with population growth. Only in 1960 did a meaningful increase in relative figures of government revenues appear. As far as the stability of the export sector means stability of the primary sector of the economy, and as far as the relative little change on budget figures means really little change on government functions, the conclusion is that the most traditional sectors of the power system of the Brazilian society remained unchanged - and the political history shows the consequence of this gap. A more detailed statistical analysis and the disaggregation of our data could throw more light into these gaps and reveal other details and features of the Brazilian historical process. We shall not do this here, however, but try, instead, to test some general hypothesis against the Brazilian data.

Let us come back to the distinction introduced earlier between “hard” and “soft” models of explanation. Our question is: which model is best? The answer we give as a general hypothesis is that sometimes the “hard” variables have led the historical process, and sometimes the “soft” ones do. Our goal is to show that this is so, and to specify in which conditions each of these possibilities occurs.

To make clear our question, we can better translate it in terms of the “cataclysmic” and “strategic” models, as proposed by Rapoport (Rapoport 1966). This distinction corresponds more or less to ours, with the difference that Rapoport refers to explanation models in a direct way, while we referred mainly to the type of variables the models include (actually, we can simply assume that the cataclysmic models, which deal with secular tendencies, are naturally suited to secular hard data, while the strategic models, dealing with the meaning of facts and tendencies from the standpoint of the actors, need necessarily “softer” elements of justification). To Rapoport, the two models are not exclusive, but simply two ways of looking at the same things (we can equally study chess from

a meteorological or a chess-law point of view, according to our interests). We suppose, nevertheless, that the two models are exclusive, when we ask whether the actor's behavior is made by simple responses to "cataclysmic" facts and determinisms, or whether they are determinants in themselves.

Summing up: we suppose that the question of whether a historical process is dependent upon autonomous facts, "cataclysmic" tendencies that carry the actors in their stream, or if the actors determine the process, the "cataclysmic" trends being nothing but the outcome of their actions, have different historical contexts. Besides the relevance of this problem in itself, finding out when each kind of determinism predominates leads to a methodological conclusion: "hard" models, and hard variables, are more suited for times of cataclysmic history, whereas strategic times demand the use of softer materials.

How to test this? How to see whether we had cataclysmic or strategic times, and when, in one hundred years of Brazilian history? With the risk of coming with just a few drops after so much thunder, we made a simple matrix where the main features of our data are plotted against the main features of the period under study. Some of these historical facts are internal to the Brazilian history, others are Brazilian so far as Brazil is part of a wider world. For each cell of this matrix where a symbol appear, we make the question: what determines what? The answer is not inductive, but based on the knowledge we already have about this situation. Once the question is answered, for each cell, we suppose that a general picture emerges.

We will consider seven facts, or events, which are commonly accepted as landmarks in the Brazilian history. We will discuss each of in relation to our variables, and also take into consideration the periods between them.

1. 1822 - Independence.

The lack of data for this period, and for the period immediately before it, makes very difficult our task. It is quite clear that the Brazilian independence is closely related to the decline of Portugal after the Napoleon invasion and the creation of direct commercial ties between Brazil and England. The attempts of Portugal, after Bonaparte, of reducing Brazil to the colonial status prior to 1808

encountered a strong resistance, which ended as the declaration of independence. The development of trade and the beginning of the building of a national army are consequences of a “strategic” action of a politically active elite.

2. 1940 – II Empire.

The ambiguous situation of an independence against Portugal declared by a Portuguese Prince is the key note of the political conflicts that start as soon as the Prince is declared Emperor, D. Pedro I. The conflict is, in general lines, between the “Brazilian” and the “Portuguese” parties, and manifest itself in the fight between the Emperor and the Congress. The abdication of the Emperor, the Regency period, the most unstable period of Brazilian history, are episodes of a conflict between centralization and decentralization tendencies - a development from the original, “Brazilian” vs. “Portuguese” hostilities. The beginning of the second Empire, with the Majority of Pedro II, indicates the solution of the fight in favor of the central government. A professional army is created in the fights against regional insurrections, there is an increase in trade and the government grows in size and complexity, which is expressed by the figures of government revenues and expenditures. What happens in this period and immediately thereafter is better understood, we think, in political or “strategic” terms, rather than “cataclysmically”.

3. 1865 – the Paraguayan War.

This war of the Triple Alliance against Paraguay happens in the period of full consolidation of the political strata, or the “estamento burocrático”, using Faoro’s expression (Faoro 1958). The same Duque of Caxias, the military commander who smashed the regional rebellions in the Regency period, is the victor of this war, and is raised to Prime Minister. The government reaches new levels of absolute and relative expenditures, mainly due to the war effort. But once the war ends the absolute level of revenues and expenditures does not come back to previous levels, although the military share does fall.

But some cataclysmic tendencies are already operating. The coffee industry, in a steady increase since the beginning of the century becomes absolutely dominant in the country’s economy. A contradiction starts growing between the coffee

producers, mainly from São Paulo and Minas Gerais, and the predominantly Northeastern aristocracy of the Empire.

4. 1888-9: End of slavery, and the First Republic.

The end of the slave system and the Empire one year afterwards is, it seems, mainly a consequence of the cataclysmic tendencies we referred to above. The decadence of the sugar economy is complete and the predominance of coffee is also complete. The coffee plantation is structured in a modern way, based on free labor and the coffee producers are indeed the main responsible for bringing European immigrants to the country. To this deterioration of the traditional rural basis of the Empire, without which the "political strata" could not survive, it adds the new development of urban centers where considerable political agitation goes on. Coming from a purely rural economy, at the end of the 19th century Brazil has already some embryos of industrialization, of which the following table gives an indirect measure:

Imports of cotton manufactures	
years	% over total imports
1839/40 – 1843/44	33.8
1870/01 - 1874-75	29.2
192-1904	12.8
Sources: (Silva 1953), cited by (Holanda 1977 p. 312)	

The data of inflation give an interesting hypothesis about the political conflicts of the time. It is noticeable that, during the Imperial period, the internal devaluation of the "mil réis" is consistently higher than its external devaluation. This situation is of course a consequence of the efforts of the central government to keep a strong and convertible currency -which is practically done through continuous loans from Britain . This is detrimental to the export groups, who have to change their currency for progressively less Brazilian money in relative terms – and its favorable to the importers, who can profit from artificially low exchange rates and by foreign products that are sold advantageously in an inflated internal market.

After a short military interregnum, the Republican period that starts with the 20th century means mainly a reduction in the power of the central government and the predominance of the big states. It is the time of the “coffee and milk axis”, that is, São Paulo and Minas Gerais. No wonder that our data reflect a drop on the external value of the “mil réis” and also a new rise of coffee prices in the world market – the result of a deliberated strategy that became known as “valorization”.

The old Republic, where all the issues were decided by the agreement of the oligarchies of the biggest states, was a very stable period that lasted for thirty years, as what Gino Germani would call "democracy of limited participation". But cataclysmic tendencies were in operation, and 1930 is the beginning of a new era.

5. 1929/ 30 – the world crisis and the 1930 revolution

Since the twenties, Brazil is the theater of intermittent military unrest and insurrections. The insurrects were young officers, influenced by positivist and scintificist ideologies, often mixing fascism with socialism, and the political movement they made became known historically as *tenentismo*⁶. Although without direct links, “tenentismo” is contemporary to urban unrest and labor strikes. 1922 is the year of a major tenentist uprising and is also the year of the creation of the Brazilian Communist Party. In spite the fact that the general evolution of the 1920's rebels had been towards the right, one of their more outstanding leaders, Luis Carlos Prestes, became the head of the Communist party.

There are no studies, to our knowledge, of the effect of the 1929 economic crisis on the 1930 revolution, but our guess will be that the impact was important. The sudden drop of coffee prices and the shrinkage of the country's capacity of import would necessarily have had, at least, a disturbing shocking in a political system already shaken by military uprisings and conflicts between sectors of the oligarchy. The 1930 revolution, which was a partial victory of the lieutenants in alliance with the oligarchies of Minas Gerais and Rio Grande do Sul, was less the outcome of a deliberate policy than the conjunction of the tendencies of

⁶ The best text about “tenentism” is the contemporary work of Viríginio de Santa Rosa, where the mixture of Marxist and fascist elements is clearly visible (Santa Rosa 1963).

urbanization, the development of the middle classes, the professionalization of the army and a final blow of a world economic crisis over an already deteriorating and decadent political aristocracy.

1930 can be considered, then, the landmark of the end of a decentralized and state-oriented regime. The tendency, in the period that follows, is the growing centralization of power in the hands of the central government, which comes to a high point with the creation of the “Estado Novo”, the Vargas dictatorship in 1937. The new regime means, however, only a partial substitution of the old ruling oligarchy. The revolutionary officers are incorporated in the new government, but the traditional political elites of Minas Gerais and Rio Grande do Sul remain. The difference is that, instead of electing the central government, it is the central government delegates its power to the regional and local political elites. At the same time, a political machinery is created in the urban contexts, with the development of a national system of trade-unions and patronal organizations, a system of social security and a stronger participation of the state in the national economy.

6. 1939/45 - II World War.

The second World War means, in one hand, the consolidation of Vargas dictatorship but, at the same time brings the elements that would cause his fall in 1945. Coming from a fascist-like ideology but under internal and external pressures, the Brazilian government declares war to the Axis. This participation meant, among other things, the start of heavy industrialization in the country, with the creation of the Volta Redonda steel plant, the “Fábrica Nacional de Motores” and a revival of Brazil as an exporter of some basic strategic materials, mainly rubber. But it meant also, and by the same token, an excessive concentration of power which remained with the totalitarian overtones that became unbearable after the defeat of the Axis. 1945 was a preview of the basic conflict of Brazil from this period on, a conflict that came to an end in 1964. The year of 1945 was the year of democratization but while Vargas, with the support of his urban machinery and the Communist party, wanted to preside the democratization, a convergence of other groups and tendencies led the political

process to a different direction. It is not by chance that the most important document against Vargas was the “Manifesto dos Mineiros”, issued by an important group of the ruling sector of the state that was, in 1930, the basic stronghold of the 1930 revolution. The democratization of 1945 meant the establishment of a new equilibrium between central and regional power, the first more identified with urban sectors, the second more tied with the rural oligarchies and aristocracies.

Although we could explain much of the fall of Vargas in 1945 as an indirect consequence of the post-war climate, there is no doubt that the basic element is the rearticulation of the liberal tendencies, acting as ideological coverage for regional oligarchic interests, together with more authentic liberal groups and military sectors. We cannot explain it by any kind of “cataclysmic” process not by a cataclysmic event, from the Brazilian standpoint, which was the outcome of World War II. But what the period that follows show is that the political alliances created by Vargas were too deeply rooted to disappear by a simple military coup, mainly when a formal democracy was established afterwards.

7. 1960/4 – Political and economic crisis

It would be too long and out of place to detail here the political process that ended with the 1960s crisis. Let us make, simply, a list of the main characteristics of this period, so that it would be possible to indicate the basic nature of that crisis.

- a. Economically, this is the period of intensification of the industrialization of the country. This process of industrialization has two main features. First, it develops in an economically liberal context, having São Paulo as its basis. But, second, and mainly in the Kubitschek period, it receives a strong governmental support. This creates apparently, a political cleavage between the liberal and the state-oriented industrial sectors of the country.
- b. Politically, the alliance between rural oligarchies and urban sectors, as created by Vargas, is the only formula that is able to win elections. This populist formula, which is a compromise between antagonistic tendencies,

means a growing irrationality of the administration, which has to absorb growing and contradictory demands. This irrationality comes to its high when the government loses control of inflation, the economic development stops, and the process of urbanization undermines the political control the government had over the urban working class.

This is, clearly, a cataclysmic process that could be understood and predicted almost without any reference to “softer” phenomena. It is clear, in the first place, that a political system based on an alliance between the rural aristocracy, with little economic power, and an urban working class without autonomous organization, could not stand a process of growing inflation, economic stagnation (determined by the inflationary process but mainly by the limitations of the internal market) and – again – military unrest. It is also clear, in second place, that the outcome of the crisis could not be the victory of the urban side of the alliance against the other, nor the contrary. In spite of conflicts between these and other sectors, they could only remain in power as far as, first, they remained together, so that they could win the election; and second, the rural sector had the control, so that the alliance remained relatively harmless to the military and economic and power groups.

The basic characteristic of the new regime is, thus, the weakening of the two sectors of the old alliance. The first blow was against the urban sectors, with the destruction or neutralization of the trade unions and the labor Labor Party. The second blow was against the Congress, stronghold of the rural aristocracy, now under military tutelage. In spite of the fact that the new regime was carefully planned and seems to have had an elaborated ideology that gave its basis, our suggestion is that the Brazilian military simply acted as historical puppets in the hands of the cataclysmic tendencies of economic development, urbanization and demographic explosion that our data show.

Now a new era starts, and it looks as if the country is in an impasse. If this is so, we would have to look again to political projects, articulations and maneuvers if we want to make predictions about the future. But if the economic impasse does not exist, we can expect a progressive articulation of a more modern form of

political participation and a progressive withdraw of the military rule. Our impression is that, without a governmental planning and action, the economic development is not likely to be reactivated, and in the lack of a very defined strategy of development the cataclysmic outcome would be a progressive abyss between the modern and the traditional and underdeveloped parts of the country, following the apartheid model which is not, unfortunately, a privilege of South Africa.

5. Conclusion

We do not pretend that this is a precise account of Brazilian history and it is obvious that we did not do more than some vague indications about the possible way of dealing with historical data. One of the conclusions is that the data, by themselves, tell us very little if we do not know history as the historians make it. The second conclusion is that, within these limitations, hard data constitute a solid point of reference, sometimes with explanatory power, for the understanding of historical processes.

No doubt that, if we had better data and if we treated them with more sophisticated statistical techniques, we could learn more than we can by the simple inspection of historical series. The best use of historical data, nevertheless, would be in a comparative basis, where the quest for generalization and theory formation has a more legitimate stand.

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(Note: this list does not intend to be exhaustive nor systematic. It simply presents the sources of Brazilian data we came across for this paper.

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Apendax: Historical series.

Table 1. - Population

1808	3.000.000	(3)
1819	4.396.132	(1)
1830	5.340.000	(1)
1850	7.280.000	(2)
1854	7.677.800	(1)
1872	9.930.478	
1880	12.900.000	(2)
1890	14.333.915	
1900	17.418.434	
1910	23.414.177	
1920	30.635.605	
1930	36.000.000	(2)
1940	41.236.315	
1950	51.994.397	
1960	70.967.185	

Census data. Cf. IBGE, Anuário Estatístico, 1966.

- (3) Taken from Caio Prado Jr., Formação do Brasil Contemporâneo, who discusses the validity of this estimate.
- (2) Calculated figures. For simplicity, an arithmetic progression was supposed to exist between the two adjacent known figures.
- (1) Official estimates. Brazil had Census in the years 1872, 1890, 1900, 1920, 1940, 1950 and 1960.

Table 2: Urbanization, four largest cities.

			<u>over total population</u>	
1872	631.000	25,8	1823 -	6,3
1880	709.300	6,1		
1890	872.000	6,1	1864	85
1900	1.368.000	7,4		25
1910	1.812.500	7,7		
1920	2.257.000	7,4		
1930	2.992.000	8,1		
1940	3.728.000	9,1		
1950	5.515.000	9,0		
1960	8.622.000	8,3		

Source: see table 1.

MA is
1823

1823 62000
1844 50000
1864 100000
1872 22000
352600

1864 100000
1872 8500
1876 45000
30000

66500
11780

7512

41.523
12.641
50020
42000
956123 / 11.12000

Table 3. Population in "municipios" over 100,000 inhabitants

<u>year</u>	<u>population (1,000)</u>	<u>number of municipios</u>	<u>% over total population</u>	<u>% annual increase</u>
1872	519	3	5,2%	0,5%
1890	507	3	5,7%	1,0%
1900	1,359	4	7,8	1,5%
1920	3,153	9	10,2	1,9%
1940	5,838	17	14,0	3,6%
1950	9,808	31	19,0	4,1%
1960	16,871	47	27,0	

Source: Census data.

Note: two sources of error exist. The data prior to 1920 refer only to the "municipios" that are capitals of the states and the Federal District. There is, however, little possibility that there were other units with more than 100,000 population outside the capitals. The data of 1960 are not fully available yet, so that we calculated the population of 8 municipios for which data was missing. The calculus was made upon units with more than 100,000 population in 1950, which were increased by 36%, the rate of population growth in the country. Notice that "municipios" does not mean, necessarily, urban units.

Table 4: Indexes of exchange rates and cost of living, selected years

<u>year</u>	<u>Exchange rate(£)</u>		<u>Cost of living(2)</u>		
	<u>Value</u>	<u>Index(1)</u>	<u>Index(3)</u>	<u>Index</u>	<u>Index 3/Ind.23</u>
1822	4,90	<u>100</u>	51		
1829	9,75	199	<u>100</u>	<u>100</u>	1.0
1850	8,35	170	85		
1857	9,01	184	92	153	.59
1872	9,6	196	98		
1874	9,31	190	96	174	.55
1880	10,86	222	112		
1881	10,96	224	113	190	.59
1887	10,70	213	110	231	.48
1887					x48
1890	10,64	217	109		
1896	26,47	217	270	497	.54
1900	25,26	516	260	460	.57
1910	14,81	302	152		
1912	14,85	303	153	455	.34
1920	16,58	339	166	687	.24
1929	44,02	837	422	1,094	.42
1930	44,44	909	456	993	.46
1931	65,71	1,341	675	960	.70
1932	48,53	990	500	960	
1940	791,90	1.631	830	1,504	.52
1950	104.00	2.140	1,060	5,179	.55
1959	530.00	10,800	5,000	31.918	.20
1960x					.16

Source: Oliver Onody, A Inflação Brasileira, Rio, 1960

1) 1822 = 100

2) and 3) 1829 = 100

Table 5: Trade, selected years

Year	MILHOES 1,000 "contos" value (1)		1,000 £ value		mil réis/pound
	EXP	IMP	EXP	IMP	
1821	20.0	21.0	4.3	4.5	4.6
1829	33.0	35.0	2.1	3.4	9.7
1830	35.	42.	3.3	3.6	10.4
1840/1	41.	57.	5.3	7.4	7.7
1850/1	67.8	76.9	8.1	9.2	8.3
1860/1	123.1	123.7	13.2	13.3	9.3
1870/1	168.	162.	15.4	14.9	10.3
1872/3	214.	158	22.3	16.5	9.6
1886/1	230.1	179.6	21.2	16.5	10.9
1890	280.5	255.5	26.3	24.0	10.6
1900	850.0	548.	33.1	21.4	25.6
1910	939.4	713.3	63.	47.	14.9
1920	1752.	2,090.	82.3	88.3	22.5
1929	3860.	3527.	94.8	86.6	40.7
1930	2907.	2343.	65.7	53.6	43.9
1931	3398	1880	49.5	28.7	67.4
1939	5615	4986	37.2	31.8	153.4 (2)
1940	4960.	4964.	62.5	62.5	79.9
1950	24913.	20984.	240.0	200.0	104.0 (3)
1960	247123.	201219	370.0	400.0	400.0 (4)

(1) 1 "conto" is equal to 1,000 "mil réis". The "mil réis" (1\$000) became equal to 1 cruzeiro (Cr \$ 1,00) in the forties. At the beginning of 1967 a new currency was created, "cruzeiro novo", equal to 1,000 old "cruzeiros", i.e., 1 "conto". The notation for "cruzeiro novo" is NCr \$ 1,00.

(2) The data until 1939 are from IBGE, Anuário Estatístico, 1940. The figure for 1939 does not correspond to the one given by Onody, regarding the exchange rate. For Onody gives the rate of 85,74, with which the imports in £ are 65.5, and exports 58.0

Table 5. (cont)

million pounds.

- (3) the exchange rate is given by APEC. For that time there was only an artificial official rate of about 52 cruzeiros per pound.
- (4) Based on dollar value given by the Anuário Estatístico of 1966, calculating 1 £ = 2,7 dollars.

Sources: IBGE, Anuário Estatístico, 1940, 1966

APEC, 1965

Onody, op. cit.

Table 6-- Trade Figures, relative.

<u>Year</u>	British conv.index (1950=100)	Value on 1950 pound	
		EXP	IMP
1821	46	9.4	9.8
1829	46	4.6	7.4
1830	45	7.3	8.0
1840	51	10.4	14.5
1850	30	21.5	24.0
1860	48.5	25.0	25.0
1870	47	34.0	32.0
1872	49.5	45.0	33.5
1880	41.5	51.0	40.0
1890	35.	75.0	47.5
1900	37	90.0	58.0
1910	39.5	160.0	118.0
1920	122	67.5	72.5
1929	57	156.0	152.0
1930	47	130.0	112.0
1931	40.5	122.0	70.0
1940	63	99.0	99.0
1950	100	240	240.00
1960	(137)	270.0	290.0

Source Onody, p.117, for the index. Since he does not give values for 1821 nor 1960, we took 1829 and 1956, respect.

Table 7 - trade figures, relative

Exports and imports per capita. \$ of 1950.		
	EXP	IMP
1821	2.1	2.2
1829	0.9	1.4
1830	1.35	1.5
1840	1.7	2.2
1850	3.0	3.2
1860	3.0	3.0
1870	3.6	3.4
1872	4.5	3.4
1880	3.9	3.1
1890	5.2	3.4
1900	5.2	3.4
1910	6.8	5.0
1920	2.2	2.3
1929	3.3	4.2
1930	3.6	3.1
1931	3.4	1.9
1940	2.4	2.4
1950	4.7	4.7
1960	3.8	4.1

Table 8 - Governmental revenue and expenditure

Year	Revenue				
	Revenue (1,000 contos)	Expenditure a) 1,000 contos	b) year & (millions)	c) 1950 & (millions)	1950 & per capita
1823	3,8	4,7	0,8	1,7	0,4
1850/1	32,6	33,2	3,9	10,3	1,4
1872/3	100,7	121,8	12,2	24,4	2,4
1880/1	128,3	138,5	11,8	28,5	2,2
1890	195,2	220,6	18,3	52,0	3,6
1900	307,9	433,5	12,2	33,0	1,9
1910	524,8	623,5	35,5	90,0	3,8
1920	922,2	1,222,6	55,5	45,5	1,5
1930	1,678,0	2,510,5	38,0	61,0	2,2
1940	4,644,8	5,188,9	58	94,0	2,2
1950	19,372,7	23,669,8	187,0	187,0	3,6
1960	233,012,		580,0 4	425,0	6,0

Source: ONODY, op. cit., and Anuário Estatístico, 1966. Calculated.

Table 9 - Exports of Coffee

<u>year</u>	<u>bags</u> <u>(1,000)</u>	<u>total value, £</u> <u>(1,000)</u>	<u>value per</u> <u>bag (£)</u>	<u>% of total</u> <u>exports</u>	<u>2nd.</u> <u>biggest</u>
1821	129	704	5.5	16,3	25,3(sugar)
1829	452	659	1,54	20,5	37,2
1830	480	663	1,38	19,8	36,7
1840/1	1,396	2,311	1,86	42,7	28,5
1850/1	2,485	3,906	1,57	48,1	23,3
1860/1	3,571	8,564	2,39	64,7	
1870/1	3,827	7,766	2,03	50,3	
1870/2	3,497	12,013	3,43	37,6	14,7
1880/1	3,660	11,604	3,17	54,6	
1890	5,109	17,850	3,49	50,3	
1900	9,155	18,839	2,06	67,7	
1910	9724	26,696	2,74	42,3	39,1(rubber)
1920	11,525	40,456	3,51	49,1	6% (sugar)
1929	14,281	67,307	4,71	71	
1930	15,286	41,179	2,69	62,6	
1931	17,351	34,104	1,91	68,9	
1939	16,499	14,892	0,90	39,9	20,5(cotton)

source: IBGE, Anuário Estatístico, 1940

(D. L. R. M.)

Table 9-a. Other data on coffee

<u>year</u>	<u>coffee as % of exports</u>	<u>prices (cents/lb)</u>
1940	36,32	7,0
1950	63,85	49,50
1960	56,17	36,69

Source: APSC.

Table 10 - Mail received, sent and in transit.

	<u>Thousands of units</u>	<u>Per capita</u>
1850	1,815	0.25
1853	3,175	0.42
1872	12,034	1.3
1880	20,360	1.5
1890	50,441	3.8
1900	278,480	16.4
1910	543,669	23.2
1920	642,375	20.0
1930	1,909,312	54.0
1949	3,141,107	78.0

Source: IBGE, Anuário Estatístico, 1940

Table 11 - Hydroelectric power - MW

1883	0.052
1890	1.267
1900	10.367
1910	157.401
1920	367.018
1930	778.800
1940	1,243.877
1950	11,882,500
1960	4,300,000
1965	7,411.000

Source: APEC, n.5.

Table 12 - Military expenditures as % of national expenditures

1823	64%	1852/3	40	18xx	
1828	35,5	1855/6	40,5	1900	17,1
1829	40	1857/8	48	1905	21,3
1826	38	1859/60	42.5	1910	20.8
1827	38,5	1862/3	34.5	1920	16.7
1828/9	47	1864/5	49,0	1930	19.3
1829/30	47 44	1865/6	66.0	1932	31.4
1830/1	34	1866/7	66.0	1937	30.8
1831/2	35	1867/8	59.6	1939	25.2
1833/4	41	1868/9	53.5		
1835/6	32,5	1869/70	53.5		
1837/8	42	1870/1	32.0		
1839/4	55	1871/2	30.5		
1840/1	55	1872/3	40.5		
1843/4	41,5	1873/4	32.5		
1845/6	40.5	1874/5	32.5		
1847/8	38.5	1876/67	26.5		
1849/50	40	1877/8	15.5		
1850/51	50	1878/9	12.6		
1851/2	48.5	1879/80	16.0		
		1881/2	20.5		
		1882/3	17.5		
		1883/4	20.0		
		1885/5	17.5		
		1888	18.3		

Source: Carrera, História Financeira do Brasil;
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(Note: This list does not intend to be exhaustive nor systematic. It simply presents, in alphabetic order, the sources of Brazilian data we came across for this paper. Expressions between parenthesis indicates call numbers at the Univ. of California Library).

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